A THEORY OF ABLAUT

Thesis: The IG. ablaut *e*, *o*, the so-called "qualitative" ablaut, arose, just as did the so-called "quantitative" ablaut, from a reduction of stress; the *o*-stage resulted from a *partial* reduction of the stress, and represents an intermediate stage between *e* and the complete loss of the vowel.

Scholars have been inclined to look upon qualitative and quantitative ablaut as *two essentially different* phenomena. (Cf. Hirt, Der idg. Ablaut, p. 1, Streitberg, UG. §§ 44, 45, and Got. Elementarbuch, § 81; Bethge, in Dieter, Altger. Dial. § 17, etc.). They hold that the quantitative ablaut is due to a reduction of stress, but admit that the real nature of the qualitative ablaut *e*, *o* is not understood. It has generally been supposed to be connected in some way with *musical accent*, or *pitch*.

I wish to try to show that both phases of this phenomenon rest upon the same principle, namely, a reduction of stress; and that the vowel *o* merely represents an intermediate stage between the full vowel *e* and its complete loss. This theory seems to be supported by generally accepted facts in the fields of psychology, physiology, and physics.

First, I must discuss the question of the position of the accent in the IG. verb, with special reference to the syllable of reduplication.

I. Accent of Syllable of Reduplication in IG.

Psychological Basis of Verb Accent

Thesis: In IG. the syllable of reduplication was originally more strongly stressed than the root syllable.

The opinion obtains at present among scholars that at least at the time of the rise of the IG. dialects, the reduplicated perfect singular was accented on the verb-root, not on the syllable of reduplication. This view rests chiefly upon the facts that this is the normal accent in Skt., and that in Germanic the voiceless spirant occurs, according to Verner's law, in the preterite singular, as in the infinitive. (Regarding the latter point see § IV below.) But there is considerable evidence which points toward an accent of the syllable of reduplication; in Skt. there are a few cases of variable and double accent, as *dadhītá* and *dádhīta*. (Cf. Brugmann, Kurze vergl. Gram. § 623.) Again, in Greek and Latin and Germanic, the syllable of reduplication was generally stressed,

λέλοιπα, mémini, taítok. To be sure, these may represent a later shift of position, but so also may the Sanskrit. Even if we admit, however, that the chief stress rested on the root at the time of the rise of the IG. dialects, there is no reason for denying the possibility of its having been at an earlier period on the syllable of reduplication. (Hirt, *Der idg. Akzent*, p. 177-178, avoids a positive statement.) In IG. times the reduplicating prefix had become a mere formative element.

I believe that originally at the time of the rise of IG. ablaut *e*, *o*, the syllable of reduplication was more strongly stressed than the root. This view is plausible on theory from the point of view of psychology. Let us glance briefly at the phenomenon of reduplication. One of the chief functions of reduplication in IG., as in other languages, was to express the idea of repetition with reference to an act, e.g., *derk*, "see," *dedorka*, "I see *repeatedly* or *frequently*." This form of speech arose, no doubt, first in words which represented an attempt to imitate certain repetition-sounds in nature, as Greek πιπίζω, ὀλολύζω; Latin *pīpīlare*, *ululāre*, etc., and from these it was extended so as to designate a *special manner* of performing any act, namely, the *iterative* manner. And naturally the idea of iteration or repetition with reference to an act would associate itself with that particular sound-element of the word by which this special manner of performing the act was distinguished from the simple, single act, that is, the iterative idea attaches chiefly to the syllable of reduplication.

When we shift our attention from the simple act to a special manner of performing the act, then this latter occupies the focus or region of greatest clearness in our attention and the simple act is removed somewhat toward the margin of attention. It is not, however, a case of complete suppression of the first idea, because we cannot lose sight of the *act* when focusing the attention on a special manner of performing the act; it is merely that the latter element occupies a region of greater clearness in our consciousness than the former. There are varying degrees of partial clearness, i.e., degrees between clearness of attention and the removal from the realm of the conscious. Now the psychologists tell us that our physical reactions are most intense on the focus of attention; in speech this expresses itself in an increase of stress, which is normally accompanied also by a raising of the pitch; (to be sure, this normal parallel change both of pitch and stress may be upset by

the introduction of some strong emotional element). Hence from the point of view of psychology, it is only natural that originally the syllable of reduplication should have been more strongly stressed than the root syllable, or that the root syllable should have undergone a reduction of stress as compared both with the syllable which now represents the focus of attention, and also with the ideal root syllable when the simple act occupied the focus of attention; and we shall see in the following sections that the vowel *o* as compared with *e* represents from the standpoint of both physics and physiology a reduction of stress (and pitch). This theory of accent finds support in the accent of other forms of the verb, e.g., the perfect plural, Germanic *hl̥pum** < *hélh̥pəmé*, *buðum* < **bébuðəmé*, *nēmum* < **nénməmé*; and again in the perfect participle Germ. *buðans* < **buðanâs*, *stigans* < **stiganâs*, *numans* < *nm̥anâs*, etc. Let us look first at the perfect plural. The simplest and most natural way of conceiving of most acts is that they are performed by *one* person. The performing of an act by more than one person constitutes the *abnormal*, the *unusual* situation, in contrast to the *normal singular*; i.e., the idea of *plurality* crowds itself into the focus of attention. Is not this the real reason why in IG. the personal endings were accented in the dual and plural, but not in the singular? As to perfect plural, we have then two elements, repetition and plurality, which predominate over the fundamental idea of the act itself. These two elements together crowd the original idea even farther out into the margin of attention, and the physical reaction for it is weaker than in the case of the reduplicated singular, in fact so weak that the sonant element of the syllable, which is the chief bearer of the stress, is lost, i.e., the vowel disappears entirely.

Or take the case of the past participle. The two chief suffixes in IG. were *-nó* and *-tó*; with these sound groups there was associated the idea of the *person* or *thing affected by* an act, or of a *state resulting from* an act, e.g., Germanic *bitans* < *bitanâs*, "bitten," "the bitten one" (of course, another substantive might be used in connection with the participial form, as the *bitten man*); *burans* < *buranâs*, "the borne one"; *numans* < *numanâs*, "the taken one or object' IG. *pl̥nós*, "filled;" or IG. **dətós*, "the thing given," etc. In all of these cases the focus of attention is so occupied by the *person* or *thing* or *condition* connected with the act that the reaction for the act itself is very weak, i. e., the sonant element of that

sound-group is lost (except when this would result in an unpronounceable combination of consonants, as in *dətós.*)

Again, the accent in causative verbs and in the optative mood is entirely in accord with this psychological principle. The IG. causative suffix *-éjo* is psychologically quite parallel to the reduplicating prefix; each represents in connection with an act that element which occupies the focus of attention, hence each is more strongly accented than the element which represents the simple act itself; but in centering our attention either on a *special manner* of performing an act or on the *causing* of the performing of the act, we can crowd out only to a slight degree the idea of the act itself, and consequently in both cases we find in the root the vowel *o*, which represents a partial reduction of stress and muscular tension as compared with the associated vowel *e*: Greek τρέπω, turn, τροπέω, cause to turn; φέρω, bear, φορέω, cause to bear; Gothic *frawaírþan*, to perish, *frawardjan*, to destroy; Modern German *trinken*, *tränken*; *sitzen*, *setzen*, etc.

The IG. optative suffixes *jḗ*, *i̯ḗ*, in connection with a verb, expressed the idea that an act or a state was *desired* or *not desired*, or was a *possibility*, but by implication *was not*, or *should not be a reality*, the sound-group which represented this attitude of the speaker toward the *non-existence* of the act or state drew to itself the strong stress, to the complete suppression of the primary sonant element of the verb-root; e. g., Old Latin *siem* < *esjḗm*; OHG. *sīm*, *sīs*; so also in perfect forms, as Skt. *vavṛtyat*, OHG. *wurti* < *wṛtí* < V*vert* etc.[1]

Another reason for maintaining that the syllable of reduplication was originally more strongly stressed than the root-syllable is the very fact that the vowel *e* passed over into the vowel *o*, because the sound *o* as compared and associated with the sound *e* represents a reduction of stress, of pitch, and of muscular tension of tongue and vocal cords, as will be seen from following sections; generally accepted facts of physiology and physics bear out this statement, and it is in accord with the practical experience of singers.

II. Physiology of Tongue Muscles in Vowel Formation

There are three chief sets of muscles in the tongue, the main ones running lengthwise, then transverses running from the cen-

[1] In the thematic verbs, as IG. *bher-o*, the opt. suff. *i* combined with the theme vowel *o*, losing a large part of its energy, as a result of which the root-vowel was strengthened and preserved, or restored; thus opt. IG. *bheroi*, Goth. *bairai*, OHG. *bere.*

tral septum out to each side, and lastly the small vertical muscles which extend from the upper surface of the tongue down a short distance into its body. The muscles of this third group enable us to make the surface of the tongue tense, convex, or concave; those of the second group, to make the tongue wide or narrow, and to turn the sides up and down. But for the point in question, namely, the ablaut *e*, *o*, we need consider only the muscles of the first group and in particular only one, the big *genioglossus*, which is attached to the rear side of the chin bone and radiates from there out into the tongue in its entire length from root to tip. Three sections can be distinguished: (a) the *anterior fibres* which lead toward the front part of the tongue; (b) the *middle fibres* which terminate in the central part of the main body; and (c) the *posterior fibres* which go to the back and root of the tongue and are attached to the hyoid bone. The contraction of this muscle as a whole draws the tongue forward in the mouth, and the contraction of the anterior fibres pulls the point and tip down behind the lower teeth. In addition to the *genioglossus* we should note a small pair of muscles which are used to draw the tongue *back* and *up*, namely, the *styloglossus*, the two parts of which are attached to the styloid processes slightly below and behind the ears and terminate in the sides of the tongue.

Now we must remember a few facts about the action of muscles: (a) Muscles act by *contraction*; we receive a stimulus either actually from without, or from memory or imagination; this is conveyed to the brain, thence by the motor nerves to the muscles, which as a result of the stimulus contract; the intensity of the contraction varies with the intensity of the stimulus. (b) The tongue muscles, like other muscles, are at all times, even in rest, partially contracted. If, for example, the genioglossus be relaxed, the tongue from its own weight falls back in the mouth, and unless controlled and directed and held up in its backward movement by the styloglossus, it may cause strangling, as, for example, in anaesthesia, in which precautions must be taken to hold the tongue forward mechanically. (c) When a muscle contracts, its opposite or antagonistic muscle relaxes proportionately; and when the contracted muscle relaxes, its antagonistic muscle contracts back to normal, or even beyond normal if the preceding contraction has been a particularly strong one. (d) The tongue is a flaccid mass which can be pulled and squeezed into many different shapes and positions by the contracting muscles.

Let us now look at the tongue positions for the chief vowels from the point of view of the contraction of the tongue muscles. We spenk of *i* as representing high front tongue elevation, *e* mid-front, *a* nearly normal, *o* mid-back, and *u* high back elevation. What really happens is this: if the large genioglossus is strongly contracted, the point of the tongue is drawn down behind the lower teeth, and the main mass of the tongue is *piled* or *humped* up in the front of the mouth close to the hard palate; the so-called *elevation* of the tongue is merely the natural consequence of its being drawn forward. If the contraction of the genioglossus is less tense, the back of the tongue is not humped quite so high, the result being the vowel *e*. A further reduction of the contraction results in the *a* position, and still further reductions result respectively in the *o* and *u* positions. For the two latter there is a corresponding contraction of the *styloglossus*, by which the tongue is drawn back and slightly up.

Now, to be sure, the tongue can be placed in any of these positions and also in many intermediate ones, either deliberately and consciously, or automatically as the result of habitual associations. We are not concerned here, however, with what the tongue *can* do, but rather with that it *does* do naturally when the nerve reaction is weakened, as a result of the removal of the primary suggestion from the region of greatest clearness to a region of partial clearness in our attention. If we *normally* associate the sound *e* in the root *nem*, i. e., a contraction of the genioglossus, with the *act* of *taking*, when this *act* occupies the focus of attention, then there would be a corresponding relaxation of this muscle when the stimulus is weakened as a result of the removal of this *act* to a region of only partial clearness in our attention. And this relaxation of the genioglossus, which may follow either an *actual* or an *imagined*, a *potential* contraction, allows the tongue to fall *back* in the mouth; the styloglossus, which is the antagonistic muscle, catches the rebound, so to speak, and contracts slightly beyond normal, thus controlling and directing the tongue in its backward movement and giving it that position which is most advantageous to the production of the tone which, in a certain sense, is the counterpart of *e*, namely, *o*. The meaning of this will become apparent in the following section.

The theory that *o* is the counterpart of *e* from the point of view of physiology as well as of physics is strengthened by the

OHG. change of *e* to *i* before *u*, that is, *gibu* < **gebu*. The *u* position is the counterpart of the *i* position, just as *o* is of *e*; and if the tongue is going to operate from a front contraction to this *extreme* back position *u*, it prefers to do so from the *extreme* front position *i*, just as it does from the less extreme *e* to its less extreme counterpart *o*. It seems as if the main tongue muscle, the genioglossus, prefers to contract to an extent proportionate to its following relaxation. It, like all muscles, shows a preference for *pendulum motion*. And again, when the movement is reversed, i. e., from a weaker toward a stronger contraction, this large muscle seems to prefer to perform all or at least a large part of its work at the very beginning; this is the physiological principle involved in the change of *e* to *i* before *i*, as OHG. *irdīn* beside *erda*, and in all forms of umlaut, as *gesti* < *gasti*, *löcher* < *lohhir*, *würfel* < *wurfil*, and in the change of *u* to *o* before *a*, as *gold* < *gulpas*. Of course, the psychological element of mental keenness, alertness, anticipation, plays the important rôle in determining the physical reaction.

III. Physical Properties of the Vowels

In order to bring out clearly just why in IG. the sound *e* became *o* and not something else, when a part of the stress was removed, I shall have to state a few fundamental facts regarding the physical nature of musical sounds in general and of the vowels in particular, for a vowel is a musical sound. The best recent work in this field has been done by Professor D. C. Miller, Professor of Physics in Case School of Applied Science, Cleveland, Ohio; his book is entitled The Science of Musical Sounds, The Macmillan Company, 1916.

Sound is produced by the vibration of an elastic body; this sets up a disturbance in the surrounding air. If the vibrations are regular and periodic, the disturbance of the air takes a definite wave-form, and we receive it through the ear and perceive it as musical tone. We can hear sounds ranging from about 16 to 30,000 per second, although the upper limit of the musical scale is about 4200. If the vibrating body, or generator, vibrates as a whole in its entire length only, then the resulting tone is a pure tone, or fundamental; but if in addition to its vibration as a whole there is also a vibration of two or more parts, or sections, then these partials, or overtones, are added to the fundamental,

and the total result is a compound tone. Most musical tones are compound. The tuning fork, however, gives out a pure, simple tone. The *loudness* of a tone depends upon the energy brought against the vibrating body, i. e., upon the size or amplitude of the waves that are sent out. The *pitch* is determined by the frequency of the vibrations per second, increased frequency producing rise of pitch. Increase of frequency is the result of increase of tension of the generator. The *quality* of a tone is determined by the number, composition, and frequency of the partials, or overtones. The tone of a vibrating body is reinforced and amplified if the waves are caught up and allowed to *resonate* from a resonating surface or in a *resonance chamber*, as, e. g., the box of a violin, or the pipe of an organ or of a reed instrument. The resonance chamber picks up especially certain of the characteristic overtones of the generator and amplifies them, but it naturally cannot reinforce anything except what is furnished to it by the vibrating body, the generator.

Now the organs of speech constitute a musical instrument; the vocal cords are the generator of the sound, and the chest, but more expecially the mouth and nasal cavities, form the resonance chamber. The average vocal cords have a considerable range of pitch, and the resonance chamber can be given a great variety of shapes by means of the muscles of the tongue, jaw, and lips. The resonance chamber has a pitch and tone quality of its own, the *resonance* tone, German "Eigenton," apart from the pitch and quality of the vocal cords, the *voice* or *cord tone*. As the shape of the resonance chamber changes, its pitch and tone quality change. This can be determined by whispering the vowels; also by fixing the mouth for the different vowels and then sounding a tuning fork of the corresponding pitch before the mouth. It has been found that *i* has the highest resonance pitch, *u* the lowest; the intermediate pitches down from *i* to *u* are through *e*, *a*, *o*. There has been some difference of opinion among investigators as to the relation of the resonance tone to the voice tone. But the recent work of Miller verifies the conclusions of Helmholtz, one of the greatest physicists of the nineteenth century, and we may accept their view as the most trustworthy. According to these scientists, the mouth resonance is identical with one or two of the overtones or groups of overtones of the vocal cords, and these overtones are picked up and amplified by the resonance chamber.

I should judge, then, that we are justified in concluding that there is a natural adjustment between the vocal cords and the mouth; the resonance chamber is for each sound so shaped as to resonate to the best advantage the tone furnished to it by the vocal cords, and on the other hand, the cords are tuned up to furnish at least those overtones which are best suited to a given resonance chamber.

The physicist has several devices for recording the wave-form of a sound, and thus he is enabled to study the composition of a tone and to determine the number and pitch of the overtones; this is of great importance, for it is the overtones that give to each tone its characteristic quality. Professor Miller has analyzed the tones of the eight vowel-sounds which occur in the English words: *father*, *raw*, *no*, *gloom*, *mat*, *pet*, *they*, *bee*, i. e., *a*, *ɔ*, *o*, *u*, *æ*, *ɛ*, *e*, *i*, and has recorded the set or sets of overtones which constitute the characteristic resonance of each of these vowels. He finds that in each of the back vowels there is *one* set of partials, within a certain narrow range of pitch, that give to each sound its characteristic quality, and this he calls the chief *region of resonance*. The pitch of these partials is highest for the sound *a* in *father*, representing a frequency of about 1050 vibrations per second, and it gradually becomes lower for *ɔ*, *o*, *u*.

He finds further that in each of the front vowels, *æ* (mat) *ɛ*, *e*, *i*, there are *two* such sets of partials, or two characteristic regions of resonance, first, a low one, which in each vowel-sound is practically identical with that sole region of resonance of its corresponding back vowel, and second, another one of very high pitch, or frequency; the pitch of this second set of over-tones increases from *æ* (mat) to *i* (bee) regularly, as that of the other set of lower overtones decreases. For example, the characteristic overtones of *o* have a frequency of about 460 vibrations per second, those of *u* about 325. The vowel *e* has two sets, or regions, a lower one with a frequency of about 480, and a high one of about 2500; the two regions of *i* are at about 308 and 3000. In the front vowels it is this second region of high frequency which gives to each its characteristic quality; and it has been shown by actual experiment (the synthetic reproduction of the vowel-sound by a group of pipes, in which each one represents one of the component elements of the sound; any one of them can be removed at

will) that if this second region of high frequency be removed, then *i* becomes *u*, and *e* becomes *o*.

It seems to me that these facts are of the greatest importance in a study of IG. and Gmic. sound-changes. In the case of the ablaut *e*, *o*, we have merely to see whether in actual speech anything happens that would naturally tend to eliminate that set of higher overtones of the vowel *e*, as a result of which *e* would pass over into *o*. Those overtones are present both in the cord tone of the larynx and also in the resonance tone of the mouth cavity, for the resonance chamber can only reinforce what is furnished to it by the generator. Let us look at each of these.

If we examine drawings of the shape of the mouth cavity in the different vowel positions, we notice that for the front vowels this resonance chamber consists of two parts, the larger and more oval part between the tongue and the soft palate, and a smaller, narrow part between the front of the tongue and the hard palate. In advancing from the sound *e* to the sound *i*, the back chamber becomes larger and the front passage smaller. For the back vowels with the tongue in the back of the mouth, the resonance chamber has only one part, and this is in front of the tongue extending up to the lips. But this one chamber resembles closely both in size and shape the rear one of the two chambers of the corresponding front vowel; the rounding of the lips for the back vowel aids materially in forming such a chamber. The resonance chambers of corresponding back and front vowels are, then, practically the same, except that the front vowels have in addition a small narrow passage, or vestibule, in front of the larger chamber. Now, since the frequency of vibrations increases as the size of the resonance chamber decreases, it is evident, according to Helmholtz and Miller, that in the front vowels with their two sets of high overtones the lower ones are resonated in the larger back chamber and the higher ones in the front narrow passage. If this front narrow passage is lost, as it is when the tongue falls back to the *o*- position upon the reduction of the stress and tension, then the high partials have no suitable resonance chamber and they disappear, but the tongue takes the position necessary to create again the *large* chamber in which the other, the lower overtones of *e*, which are the same as the characteristic overtones of *o*, can resonate.

If the high overtones of *e* disappear from the *resonance tone*, as a result of the changed shape of the mouth cavity which, as we saw in the preceding section, was caused by the relaxing of the tension of the large muscle, the genioglossus, is it probable that they also disappear from the cord tone? I think it is; for the same cause that brought about the relaxing of the genioglossus, namely, a weakening of the energy of the reaction, would also produce a weakening of the energy of the stimulus to the vocal cords; and it is a well-known fact of physics that a reduction of the energy which is applied to a vibrating cord is accompanied by a suppression of the higher overtones; the more lightly a cord vibrates the more nearly does it approach a pure tone. This can be easily tested by striking, first gently, then strongly, a note on the piano; the strong stroke will bring out clearly some high partials which will not be heard when the stroke is light. The reduction of the energy of the vibration is also accompanied by a lowering of the tension of the vocal cords (for the organism works as a whole) resulting in a lowering of the actual pitch of the cord tone. This is, however, not the essential point in the explanation of the change of *e* to *o*. We can pronounce any vowel at almost any pitch in the ordinary range of the voice. The high partials which distinguish *e* from *o* are eliminated, *not by a lowering of the pitch of the cord tone*, but as was stated above, by a *lowering of the energy* or *force of the vibration*. But this much is true, that there is a natural tendency of the resonance tone and the cord tone to follow each other. As the pitch of the voice falls we are inclined to use the *o* and *u* tongue positions, and as it rises we prefer the *e* and *i* positions, and conversely. All singers know that it is difficult to sing a high note on the sound *u*, or a low one on the sound *i*. So we may say that there is a natural and instinctive adjustment of the parts of the organ of speech to each other. The reduction of the stress, or energy, brings about a change in the shape of the resonance chamber and a corresponding change in the quality of the cord tone.

IV. Loss of Syllable of Reduplication

Reduplication served originally to express the idea of *repetition* or *frequency*. But if one does a thing *repeatedly*, then, by implication, one has done the thing *formerly*. This element of the completed or *perfect* act, or the *past time*, then became the

dominant one in the concept, and the *raison d'être* of reduplication having disappeared, the syllable itself began to be lost. This loss in Germanic was encouraged by two facts: first, the new vowel *o*, which had been evolved by natural process, constituted a difference (as compared with *e*) great enough to carry with it the idea of *past* time in contrast to the present *e*; second, in the perfect plural the syllable of reduplication had so merged with the root in such verbs as *nēmum* (<*nénməmé*), *gēbum* (<*gégbəmé*), that these forms were apparently without a reduplicating prefix; this no doubt encouraged the dropping of the reduplication in the singular. (Cf. Hirt, *Der idg. Ablaut*, p. 196.) This occurred long before the sound-changes known as Verner's Law, so that at the time of that change the chief stress was on the root of the verb in the pret. singular, as in the present.

V. Ablaut in Substantives

A word must be said concerning the relation of the *o*- sound in nouns to the *e*-sound in related verbs, as Greek δόμος, house, δέμω, build, λόγος, speech or word, λέγω, speak, φόρος, that which is brought, tribute, φέρω, bear; Germanic *barn*, "child", *beran*, "bear," etc. Most such nouns are the names of the result of an act, or of something connected in some other way with an act. Speaking in terms of psychology, the act itself has been removed slightly from the focus of attention, supplanted by some special element connected with the act; the stimulus for the act itself is weakened, hence the intensity of the whole physical reaction which regularly accompanies the *clear* idea of the *act* is reduced, and the *o*-sound is produced instead of the *e*-sound.

Originally there may have been some other sound-group with which this idea of the *result* of the act was associated; i. e., it is possible that λόγος, δόμος, etc., do not represent the original form and accent. But this is an entirely unnecessary speculation. It is quite possible for the idea of the *result* of an act to become associated mentally with that *reduced* physical reaction itself, which resulted from the removal of the idea of the *act* to a region of only partial clearness of attention.

VI. Other Ablaut Series

1. The ablaut *ē*, *ō*, Goth. lētan, laílōt; Greek ῥήγνυμι, ἔρρωγε, calls for no special discussion; the change of *ē* to *ō* is quite parallel to that of *e* to *o*.

2. The ablaut *a*, *o*, Greek ἄγω, drive, ὄγμος, furrow, occurs in a few words. It presents some difficulties in connection with our theory. But I believe we can say this much, that, given *a* as the starting point, the primary reaction, then *o* represents in comparison with it a stage of reduced tension and energy. The change from *e* to *o* is the normal one, and the reduced stage of *a* was made to conform to this, partly from analogy, but also because there is no common intermediate stage between *a* and *o*. This ablaut disappeared, of course, in Germanic.

3. The Germanic ablaut *a*, *ō*, Goth. *faran*, *fōr*, may represent either IG. *o*, *ō*, or *a*, *ā*. This brings us to a discussion of such pairs as Greek φόρος, but φώρ, thief, ποιμένα, ποιμήν, shepherd; Latin *rĕgo*, *rēx*; *ĕdo*, *ēdi* (Germanic *ĕtan*, pret. **ēt*); *vĕnio*, *vēni*; *fŏdio*, *fōdi*; *lĕgo*, *lēgi*; etc. The explanation generally given, namely, that the short vowel was lengthened upon the loss of a following vowel, is good for such forms as φώρ, φόρος; *rēx*, *rĕgo*; but it is hardly satisfactory for the perfects *vēni*, *lēgi*, etc. It seems more probable that this type, with a lengthened vowel in the perfect, originated in verbs with an initial vowel, as Latin, *ĕdo*, *ēdi*, **ŏdio*, *ōdi*, in which the long vowel represents a vocalic reduplication, *e-edi*, *o-odi*, etc., and that from these it was extended to verbs with an initial consonant. Another explanation is given by Sommer, *Laut- und Formenlehre der lat. Sprache*, p. 598. He holds that they are similar in formation to the Germanic preterite plurals *nēmum*, *gēbum*, and that *ē* was carried over from the plural into the singular.

VII. Summary

I have tried to show, first, that from the point of view of psychology there was a partial reduction of stress on the root syllable in all forms which show the vowel *o*, as compared with an original *e*, and a still greater reduction of stress in those forms in which the vowel disappears altogether; and secondly, that in the light of physiology and physics, the sound *o*, as compared with an associated sound *e*, actually represents and corresponds to a reduction of stress and muscular tension of the whole organ of speech. I may say that I have submitted these propositions to specialists in these three fields of science, and they all assure me that the statements here made are in accord with generally accepted views in the respective branches.

Should we not then abandon the customary distinction between *qualitative* and *quantitative* ablaut, between "Abtönung" and "Abstufung," and say that *all ablaut is quantitative*, resulting from a greater or less reduction of the stress and muscular tension on the syllable in question; that the *change of vowel quality* is merely an *incidental* but *necessary result* of this *reduction*; and should we not abandon the view that both *o* and *e* are full-grade vowels ("Vollstufen") of ablaut, and recognize that the *o*-grade is really the *reduced* grade, the intermediate stage between the *e*-sound and the complete loss of the sonant element? The so called reduced grade *ə* is, I believe, of no special significance; it represents nothing more than *some* sonant element in consonant combinations which would otherwise be unpronounceable, as **dətôs*; but it does not always occur here, e. g., in forms like Latin *pedis* < **pədês*, and Germanic pp. **gebanas* < **gəbanas*, in which the difficulty of pronouncing is overcome by retaining or restoring the full *e*-sound which is *normally* associated with the simple root. And it certainly is not necessary to postulate *ə* in connection with *l*, *r*, *m*, *n*, because the liquids and nasals can be pronounced easily as sonants in connection with consonants.

C. M. Lotspeich.

University of Cincinnati.